

cocaine and used adrenalin instead, with almost but not quite the same effect. The recurrence of attacks became less and less frequent. About this time, however, after I had felt that I had been dealing with a dry sinus, I began to notice the presence of a thick mucous which would flow down after the treatment and with the aid of suction. The patient also would tell me that he would often expectorate mucous an hour or two after the treatment. This fact has led me to question the existence of the so-called dry sinusitis.

Woman, age 32, three years ago began with periodic headaches, which gradually increased in intensity until they became severe enough to put her to bed for a period from three or four days to a week. She had been thoroughly examined and given a variety of treatments, including milk diet and rest, endocrines and glandular extracts. But to no avail. Her eyes had been refracted. Sinuses and teeth had been examined by the X-ray. The sinuses had been examined by several physicians and pronounced negative. The patient's headaches were accompanied by vertigo, nausea, and even periods of delirium, often requiring opiates for relief. During the interval between attacks she was perfectly well and comfortable. On examination the nasal passages were entirely free from any signs of secretion, congestion or impingement. The possibility of frontal vacuum sinusitis was considered and a frontal sinus opened, but to no avail. At a secondary sitting the ethmoids were opened. Still no results. Finally, the left middle turbinate was removed, and the sphenoidal atrium exposed to view. There was a very small opening, hardly large enough to admit of a small probe. The orifice, however, presented a puckered appearance. The sphenoid was opened and the atrium enlarged. No discharge followed. This resulted in modifying the severity of the next attack very remarkably. Since then the attacks have become much less frequent and much less severe, until it has been possible to keep them entirely under control by local treatment of cocaine to the atrium, which is prone to close even after free opening has been made with a punch. There has never been any evidence of mucous or pus.

#### CONCLUSIONS

In searching for the cause of reflex pains of the fifth nerve and its connections through the sphenopalatine ganglion we should consider the teeth, tonsils and sinuses collectively.

The most intense reflex disturbances are often found in patients where the smallest amount of pathological changes are present. The study of this subject suggests that there is still much to be learned about reflexes of the fifth nerve.

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**Fadism in Medicine**—No doctor will be held guiltless who attempts to practice medicine without being familiar with, and willing to utilize, the various approved, auxiliary methods for making a diagnosis.

Likewise, no doctor will be held guiltless who allows his interest in, and enthusiasm for, one special trick to overshadow discretion and blind his perspective. As important as is the test-tube, microscope, and X-ray, a stubborn dependence on their findings alone would often be suicidal and homicidal.

Doctors are human, and it is a trait of humans everywhere to follow fads which often lead to extremes, but certainly no profession and no class of humans need, more than doctors, to sit steady in the boat and make haste slowly.—Editorial, Southern Medicine and Surgery, August, 1922.

## PHLORIZIN GLYCOSURIA IN THE DIAGNOSIS OF PREGNANCY \*

By MERRILL W. HOLLINGSWORTH, M. D.

(From the Johnston-Wickett Clinic, Anaheim, Calif.)

A review of the attempts to formulate some method of diagnosis of pregnancy by laboratory methods convinces that the necessity for such a test has been felt for some time. Although the menstrual history gives presumptive evidence of the existence or non-existence of pregnancy, we are all familiar with the occasional patient who menstruates several times after becoming pregnant, or even throughout the gestation period. The patient with a history of irregular menstruation before marriage presents an equally perplexing problem. And sometimes the question arises whether the diagnosis should be fibroids alone, pregnancy alone, or fibroids and pregnancy. In such cases a dependable test for pregnancy would be of inestimable value.

Bar and Ecale, in 1919, named as reactions specific in pregnancy the complement deviation, Abderhalden's dialysis, and the intradermal reactions. To these may be added the epiphanin and cobra-venom reactions and the renal glycosuria, epinephrin glycosuria and phlorizin glycosuria tests.

The laboratory work on which this report is based is limited to the phlorizin glycosuria test, which, like the renal glycosuria and adrenalin glycosuria tests, depends on the occurrence of glycosuria during pregnancy, first noted by Blot, in 1856, later by Duncan, in 1882; the frequency of its occurrence is stated as 86 per cent by Hofbauer, 75 per cent by Payer, 5.75 per cent by Williams, 70 per cent by Stolper, 68 per cent by Berg, and 4 per cent by Cron. Klemperer, in 1896, suggested that the glycosuria of pregnancy may be due to a lowered permeability of the kidney for sugar. Hofbauer, in 1899, considered it due to functional derangement of the liver; in 1911, he undertook to prove this by tests of the liver function and histologic studies. Lenhartz, in 1908, stated that it is relatively harmless. Cristalli, noting that Schroder, Reichenstein, Falk and Hesky, and Bartels had reported a large percentage of levulosuria in pregnancy, supported Hofbauer's hypothesis, as did Sachs, Strauss, and Sebatowski. The investigations of Hynemann, Landsberg, and Heinrichsdorff, however, disproved Hofbauer's hypothesis. They showed that in cases of any derangement of the liver there is some degree of eclamptic toxemia. At this point in the history of the subject blood sugar determinations were applied to the problem. Benthin claimed that the blood sugar during pregnancy is normal or subnormal, a fact corroborated by Novak, Porges and Strisower, Frank, Jacobsen, Mann, and Bergsma. Reichenstein, and later Stolper, considered the glycosuria of pregnancy to be due to a disturbance of ovarian function. The latter undertook to prove his contention by animal experiments, in which he demonstrated that hypo-function

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of the ovaries is accompanied by a decreased glucose tolerance, and a hyper-function by an increased tolerance. Von Jaskch, Lanz, Hofbauer, and Payer showed that the glucose tolerance in pregnancy is lowered. Bergsma stated that the glycosuria of pregnancy is not dependent on any derangement of liver function, but upon a physiologic hyper-function of renal epithelium. Hirschfeld, in 1910, stated that glycosuria of pregnancy is not related to true diabetes mellitus, and Shirckauer, in 1912, pointed out the important differences between the two conditions. Caldwell and Bibbs suggested that the glycosuria of pregnancy may be due to a phlorizin-like substance circulating in the blood. Novak, Porges and Strisower, in 1913, showed that the glycosuria of pregnancy is due to an increased permeability of the kidney for sugar, glucose, lactose, and levulose, and is not accompanied by a rise in blood sugar. Their work eliminated the possibility of derangement of the liver and proved Klemperer's earlier theory.

Frank and Nothmann produced glycosuria in women two to three weeks pregnant by the ingestion of 100 gm. of pure glucose; specimens of urine were withdrawn every fifteen minutes and tested for sugar. In pregnant women sugar appeared in forty-five minutes and was slight, never more than 0.9 per cent. Blood sugar determinations were made before and during the test. The authors stated that in non-pregnant women the test is consistently negative. In thirty cases, pregnancy was demonstrated in the first three months. They concluded that it is sufficiently accurate to be applied to the diagnosis of early pregnancy. Nurnberger, in 1921, in a discussion of the results obtained by Frank and Nothmann, stated that the possibility of hepatic disease, thyroid intoxication and latent diabetes must be eliminated. He repeated the experiments of Frank and Nothmann and substantiated their findings; however, he stated that this type of glycosuria disappears after the third month. Seitz and Jess, in 1922, reported that they had produced glycosuria by the ingestion of 100 gm. of glucose in fifty women from two to eight months pregnant, with a rise in the blood sugar curve to physiologic limits. McWallis, in 1921, administered 50 gm. of glucose to pregnant women and found that the blood sugar curve in pregnancy is identical with that of hyperpituitarism. The epinephrin glycosuria test was originated in 1922 by Roubitschek. The patient ingests only 10 gm. of glucose in 200 cc. of tea, and thirty minutes later receives hypodermically 0.5 cc. of 1-1000 epinephrin solution. This test, like Frank and Nothmann's simple glycosuria test, is not absolutely diagnostic, but accredited by the author as a valuable addition to the early diagnosis of pregnancy.

Kamnitzer and Joseph, in 1921, reported their results from the use of phlorizin in the diagnosis of pregnancy. Their work is based on the production of some type of "renal diabetes" by the injection of phlorizin, a fact discovered by Von Mering, in 1886, and later studied by Lusk, Halsey, Kraus; Lusk, Reilley and Nolan; Stiles and Lusk, and many others. There seems to be

some doubt whether the term "renal diabetes" should be applied to phlorizin glycosuria. It is a form of glycosuria in which there is no change in the content of blood sugar; the glycosuria results from a lowered permeability of the renal epithelium for blood sugar. This allows the sugar normally present in the blood to filter through the kidney, so that the blood sugar is actually diminished.

The procedure employed by Kamnitzer and Joseph consists of the injection of 2.5 mg. of phlorizin intramuscularly, and analysis for sugar of the urine passed thirty minutes later; 30 mgm. of phlorizin is dissolved in 30 cc. boiling distilled water and 2.5 cc. of the resulting 0.1 per cent solution is injected while still warm. This amount is one-tenth of that calculated to produce glycosuria uniformly in the normal person; so small an amount is supposed to be sufficient to produce glycosuria in the pregnant woman, since the patient already is on the borderline of renal diabetes. Kamnitzer and Joseph employed in their analysis Nylander's sugar reagent which makes use of a bismuth reduction instead of the usual copper reduction, and is very much more sensitive than the copper reagents. They reported all pregnant women to give a positive test, not stating how many were tested, 10 per cent of seventy-seven non-pregnant a positive test, and all men (ten in their series) a negative test. The positive test may be obtained two weeks after conception, they stated. Their conclusion was that a negative test excludes pregnancy.

*Author's Series*—The Kamnitzer and Joseph method of diagnosing pregnancy has been applied in a recent series of fifty-four cases in the Johnston-Wickett Clinic, consisting of twenty-eight non-pregnant women, nineteen pregnant women, and seven men. The decisive results of the originators have not been obtained. The apparent wide variations in the susceptibility to phlorizin, as judged by the depth of the black precipitate in the bismuth reduction, was striking. In this series some of the most positive tests were in men and non-pregnant women; 21 per cent of the non-pregnant women and 28 per cent of the men gave positive tests. Besides, negative tests were obtained in two of nineteen pregnant women, leaving positive results in 90 per cent in pregnancy. The test was repeated on one of the men with a positive reaction with only 2 cc. of the solution (2 mgm. phlorizin), and a positive test was obtained again. Three of the six positive tests in non-pregnant women were obtained by the use of only 2 cc. of the solution. The two negative tests obtained in the pregnant women were with 2.5 cc., one during the third month, the other during the fifth month of pregnancy. In carrying out the test, comparison was made of the urine before and after the injection of phlorizin by the use of control specimens from the patient, since the small amount of sugar normally present in the urine gives some reduction. The conclusion concerning the phlorizin method of diagnosing pregnancy in this series

was, therefore, that it is simple and easily applied, but greatly lacking in dependability.

#### DISCUSSION

**John Vruwink, Los Angeles**—The history of the patient and bimanual examination are still the only ways we have of diagnosing pregnancy. I am sure any one practicing obstetrics would welcome any procedure that would make definite a diagnosis of pregnancy, not only when there is a question of fibroids. Some definite method that would tell us whether or not a woman is pregnant would surely prevent a certain number of operative procedures incidental to a wrong diagnosis. Any efforts that are made to find this definite method are of great value. Whenever a procedure is first brought out, certain definite conclusions are drawn. For instance, Abderhalden's test for pregnancy when first published was rather definite in its conclusions, but since then has been shown to be unreliable. The work of Hollingsworth certainly proves that there is no definite method that permits us to conclude whether a patient is or is not pregnant.

Abderhalden's test is so far the best known method, but the very complexity of that procedure itself puts it into the hands of a few specialized workers and consequently is not available to the practitioner at large. The shortcomings of Abderhalden's test in the presence of various other conditions are well known. It is a fact that the urine of pregnant women contains one or the other type of sugar at certain periods. This occurrence has been estimated to vary from 40 to 80 per cent. Whether the increased permeability of the kidney of pregnant women to sugar will be of value in utilizing it as a diagnostic procedure is questionable. It seems to me that any deductions that can be made from the increased permeability will be relative because it is never known in a particular pregnant woman what her sugar tolerance may be. It is questionable in my mind whether the ingestion of glucose or the epinephrin glucose method will result in any definite advantage, although it will be well worth while to make further observations.

**M. W. Hollingsworth, closing**—The Abderhalden dialysis test has been found so unreliable that there is considerable contention as to its value, not only in the diagnosis of malignancy, but in the diagnosis of pregnancy as well. Van Slyke, Vinograd, Villchin and Losee developed a refractometric method for the determination of serum protease with the particular object in view of applying it to the Abderhalden reaction. This is highly accurate and eliminates to a very great degree the subjective element. They found the serum of non-pregnant women showed as much ferment activity on placental albumin as the serum from pregnant women.

However, those tests based on the tendency of women in pregnancy to develop a type of renal glycosuria offer us more hope. It is from these that we may look forward to the discovery of a dependable laboratory test for pregnancy.

(Since the reading of this paper Joseph reports using only 2 mg. phlorizin and positive tests only in first three months of pregnancy. E. Schilling and M. Goebel, using this modification, find febrile patients give positive tests. Sachs finds the test of only doubtful value (14 per cent of pregnant women giving negative tests). J. Hofbauer reports further studies on alimentary glycosuria in the diagnosis of pregnancy. Bathe, and also Hollauer, report good, but not absolute, results with Frank and Nothmann's test. K. Hellmuth reports that the phlorizin and adrenalin tests must be discarded. He obtained better results with Frank and Nothmann's test.—Author.)

## A SURGICAL STUDY OF ARTERIAL DECORTICATION \*

By C. LATIMER CALLANDER, M. D., San Francisco  
(From the Department of Surgery of the University of California.)

In 1918 Professor Halsted interested me in what was then the comparatively recent work on peri-vascular surgery reported by René Leriche of Lyons, France. In a long series of papers, Leriche has called attention to periarterial sympathetic nerve plexuses, and he specifies that certain definite clinical results follow the excision of these structures in the treatment of different clinical syndromes.

The surgical removal of these structures, an operation called by him "Sympathectomy," was conceived, proposed and accomplished in 1889 by his teacher, Jaboulay, who performed it with curative results on the femoral artery in certain perforating ulcers of the foot, and to a less successful degree on the coeliac trunks in visceral disturbances, the nature of which has not been ascertained.

#### TECHNIC OF THE OPERATION

Leriche has designated his operation as an "Arterial Sympathectomy," according to the arterial level at which it is performed—axillary, brachial, iliac, femoral, etc. The main arterial trunk is exposed by an incision 10 or 12 cm. long at a point a considerable distance proximal to the portion of the extremity which is affected. For example, the brachial artery is the operative site of election for disturbances in the forearm and hand, and the common or superficial femoral arteries in the foot or leg.

The external fibrous sheath covering the artery is divided over the length of the incision, and the artery, with its inner, more intimate sheath and adventitia, is now exposed. This inner sheath, which is fused with the adventitia, is grasped with tissue forceps and is incised directly on the vessel wall. Traction is maintained on one of the lips of the sheath of filmy tissue thus isolated, and this structure, containing for the most part adventitia, is completely freed from the artery throughout the wound with a knife or fine scissors.

Certain objective reactions in the hands of Leriche and his compatriots have been said to follow, and be consequent upon this decortication. During the course of the operation the arteries are progressively reduced in size to a third or half of their normal volume. Following this constriction there occurs a peripheral vasodilation, which is evidenced by a rise in surface temperature over those parts distal to the operation. A third reaction, which he notes as constantly following the operation, is a rise in the systolic pressure over the affected extremity.

#### CLINICAL PICTURES OF THE DISORDERS CURED BY LERICHE

We cannot fairly compare our results with those of Leriche, since our patients do not correspond in their clinical pictures to those in whom he obtained such spectacular results. In his hands arterial decortication afforded relief in a number of clinical syndromes, most of which he considers

\* Read before the Surgical Section, California Medical Society, Yosemite National Park, May 17, 1922.